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EP 0 277 800 B1

Description

This invention relates to an electrical connector for connecting at least one flexible wire to an electrically conducting terminal means other than a plug pin. The invention has particular utility in respect of an electrical connector in which two or more first flexible wires are connected to, respective, two or more second flexible wires.

In a previous patent application (WO 87/00977) (hereafter referred to as "my previous application") I have described an improvement in electrical plugs that utilizes a rotational action to effect an electrical connection between a wire and a plug pin via a two-component wire trap.

In this invention I propose the use of a similar two-component wire trap acting in a manner previously described, to effect electrical connection between at least one flexible wire and an electrically connecting terminal means. A connector according to this invention benefits from some or all of the advantages described in my previous application.

In its broadest aspect this invention relates to an electrical connector in which a flexible wire is placed into electrical connection with an electrically connecting terminal means by means of a two-component wire trap, one component of which is electrically connected to the said terminal means. The invention is characterized in that the two components of the wire trap define convex and concave members movable between relatively "open" and "closed" positions about a turning axis, a wire passage is provided for receiving wire fed in endwise thereof and terminating between the two components in their "open" position whereby an exposed end of a wire passed along the wire passage is trapped between the concave and convex members as the latter move into their "closed" position, the trapped wire being bent through a right angle or approximately a right angle between the end of the wire passage and its position in the "closed" wire trap.

Desirably the concave member is mounted on one part of a body of the connector and the convex member on another part of the connector, the two parts being turnably mounted to move about the turning axis which desirably extends substantially normal to the elongate direction of the wire passage.

Throughout this specification the terms "open" and "closed", when used with respect to the relative positions between two parts of the body of a connector mean that the wire traps associated with those body parts are, respectively, "open" and "closed" in these specified positions and that the connector body is respectively "open" and "closed" to wire insertion into the wire traps.

Preferably at least two wire traps are provided which move together between their closed and open positions about a common turning axis. Suitably there are three wire traps one for a live or line wire, one for a neutral wire and one for an earth wire.

When it is desired to connect two three-core wires together, two sets of three wire traps can be disposed side-by-side, each set of three traps being independently movable together between their open and closed positions.

Preferably the sets of wire traps that make up a connector or part of a connector are movable between open and closed positions by means of a captive lid turnably mounted on a body portion of the connector. When the trap(s) is/are in the open position suitable the inlet end of the/each wire passage is exposed to receive wire and to duct a bared end thereof to a position between the concave and convex members.

Desirably a body of the connector includes means to gauge the length of each wire required for correct wiring-up of the connector. The body can also be provided with further means to strip the required length of insulation from the free end of each wire.

Suitably the body of the connector incorporates a fuse, a passage being provided in the body into which a cartridge fuse can be located when a lid thereof is in the closed position and which serves to lock the lid in its closed position.

Desirably where a plurality of wires are connected, the wire passage provided for each wire is of substantially the same length as the wire passage provided for each other wire so that each wire can be of the same length.

The body of the connector may include means to allow visual confirmation that at least one of the wires is correctly located in its wire trap.

One or more wire traps may be connected to a central spindle or other rotational device such that by rotating the spindle or equivalent device, electrical contact may be effected at a number of wire traps simultaneously. These wire traps may be electrically insulated from one another or may be electrically connected to each other. The wire traps may be in the same plane as each other or disposed along the length of the spindle so as to stack up one above, or alongside the other or others.

An instance of an application for this electrical connector requiring the connection of many wires to a remote electrical power source is to be found where a number of pieces of electrical equipment, situated in close proximity to each other, such as a stack of hi-fi equipment, require connection to a power source.

At present a bulky adaptor or adaptors is/are

required to receive a plug from each appliance.

The present invention would allow insertion of bared wires, connected to each appliance, into a device containing a number of the proposed electrical connectors arranged around one or more spindles to effect rotational contact. Each bared wire would desirably be fed into a separate wire trap and rotation of one or more spindles would effect electrical contact between the wires and the wire traps which in turn would be connected to an electrical power source via a cable and a single plug.

Due to there no longer being a necessity for accommodating bulky plugs from each appliance, such a multi-connector could be a great deal smaller than adaptors currently available and could benefit from some, or all of the advantages described in my previous application.

Specific embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 shows, in plan, a wire laid across a receptor of a wire trap in an open or unconnected position,

Figure 2 shows in plan the wire trap of Figure 1 in the closed or connected position,

Figure 3 shows in axonometric, in an open or unconnected position, a single probe and two receptors,

Figure 4 shows in axonometric, in an open or unconnected position, a single receptor and two probes,

Figure 5 shows in axonometric and in the unconnected position, two wire traps stacked one above the other able to rotate about the same spindle,

Figure 6 shows in axonometric the arrangement of Figure 5 in the closed or connected position,

Figure 7 shows a top plan view of one embodiment of connector designed to electrically connect two 3-wire cables together,

Figure 8 is a view similar to Figure 7 showing the lids removed, and

Figure 9 shows a section on the line IX-IX of Figure 7.

Referring to Figure 1, a bared end 3a of a wire 3 is laid across a U-shaped receptor 2. A soldered lug or terminal point B may be electrically connected to the receptor 2 in order to attach a wire, conductor or electrical component to the receptor. The bared wire 3 may be inserted endwise along a wire passage 7 (shown schematically with dash lines in Figure 1) similar to that described in my previous application.

A probe 1 is situated so that it can rotate through a quarter turn about a rotational point X in the direction of the arrow indicated. This rotational point may be a spindle to which the probe 1 is rigidly attached or it may be the center of rotation of, for instance, a disc to which the probe is attached. Alternatively the probe could be guided to move along a curved groove (not shown) of which the point X is the center of curvature.

A lug or terminal point A may be attached to the probe in order to attach a conductor or electrical component.

Referring to Figure 2, the probe 1 is now shown rotated through a quarter turn, in relation to Figure 1, about the point X. The bared end 3a of the wire 3 has been bent through approximately 90° and is now trapped between the probe 1 and the receptor 2 and electrical contact is effected by the clamping action. The probe 1 is here shown retained by a bend 2a in a short leg of the receptor 2 and although this, or some similar means of retaining the probe in the receptor is desirable, it is not to be deemed to be essential.

Either the probe 1 or the receptor 2 or both must be capable of conducting electricity. Either one or both may be made of brass, copper, phosphor bronze, or electrically-conducting plastic,for instance, to ensure good electrical conductivity.

If either the probe 1 or the receptor 2 is electrically conductive then the other component of the two-component wire trap 1, 2 may be made of electrical insulating material, such as a plastics material. For instance the receptor 2 could be simply formed as a hollowed shape in a block of insulating material such as a block of plastics or ceramic material.

Lugs or terminal points A or B may be attached to either probe 1 or receptor 2 or to both, to accept conductors from, for instance, a remote power source.

Referring to Figure 3 a single probe 1 is shown able to rotate about a spindle 4 to effect contact with two or more receptors 2', 2". Terminal points A, B and C may be attached to this probe and the receptors.

Referring to Figure 4 a single receptor 2 may accept two or more probes 1', 1" by rotation about a spindle 4. Terminal points A, B and D may be attached to the receptor 2 and the probes 1', 1".

Referring to Figure 5 two or more wire traps 1, 2 may be stacked one above the other 1', 2', both of which are activated by rotation of the probes 1, 1' simultaneously or separately, about the same central spindle 4. Figure 6 shows the probes 1, 1' of the wire traps after the probes have been rotated through a quarter turn in relation to Figure 5 to meet the receptors 2, 2'. For clarity in Figure 6, wire ends are not shown located in the wire traps.

These wire traps 1, 2 and 1', 2' may be electrically insulated from each other or electrically connected to each other, to double the security of connection, or to make a connection to a separate

wire.

Although a 90 degree turn has been described in each of Figures 1 to 6 for moving the components of the wire traps between open and closed conditions this is merely one example and other turn angles are clearly possible.

The connectors illustrated can include a fuse (e.g. as shown at F in Figures 1 and 2), means of locking the connectors together, a cable grip, a gauge for determining the length of insulation to be stripped from a wire end and a stripping means fitted into a housing of the connector in the manner described in my previous application.

Figures 7 to 9 show a practical embodiment of connector according to the invention designed to connect two 3-core wires together via two sub-connectors.

The connector is based on a housing of plastics material having a body 8 and two captive lids 9 turnably mounted on the body 8. Handles 10 enable each lid to be manually turned through 90° between open and closed positions. The upper lid 9 in Figure 7 is shown in the closed position and the lower lid 9 is shown in the open position.

Figure 8 shows the structure below the lids 9 and the three wire traps 1, 2, three wire passages 7 and cord grip 6 of the sub-connector associated with each lid 9. The upper lid 9 has to be turned anticlockwise through 90° to move it into the open position and the lower lid 9 has to be moved anticlockwise through 90° to move it into its closed position.

Each wire 3 is independently connected and secured and a push switch 11 is located between the lids 9 to lock them in their closed positions.

The sub-connector at the bottom of each of Figures 7 and 8 is shown open ready for insertion of wire ends therein.

To use the connector to join respective wires 3 of two cords 5 together, the push button 11 is pushed down against a spring 14. This operates a switch 13 (which may be single pole or double pole) which in turn disconnects both connectors from each other. Having pushed down the button 11 both lids 9 are now free to rotate. The handle 10 is grasped and the lid 9 is rotated through 90° to reveal the input ends of three color-coded wire passages 7. The wires 3, with their bared ends 3a, are inserted endwise along the respective wire passages and the sheath of the cord 5 is pushed down into the cord grip 6. The lids 9 of both sub-connectors are then rotated through 90° (one clockwise, one anticlockwise) to close the sub-connectors and force each probe 1 into its respective receptor 2 at each wire trap thus making electrical contact. When both lids are rotated through 90° the push button 11 is allowed to spring up. This button may alternatively be a slide or rocker switch or some other form of switch. This locks both lids in place and releases the switch 13 thus connecting both sub-connectors, electrically, together via conducting strips (shown dotted) 15 running in a cavity 16 formed in the body 8. The earth conducting strip 12 remains permanently connected between the respective wire traps for the earth traps.

Figure 9 shows a section IX-IX through the connector of Figure 7.

A gauge (shown in chain lines at 17 in Figure 7) can be provided for gauging the lengths of wire required for each sub-connector. A wire trimmer, gauged for length, could also be included in the body 8 and this is shown dotted at 18 in Figure 7. The wire trimmer can be used to strip the required length of insulation from the free end of each wire 3 to leave the bared end 3a of the correct length.

The switch 11-14 could be replaced by a carrier for a cartridge fuse F whereby the fuse has to be removed before either lid 9 can be turned away from its closed position.

A window 19 can be provided (as shown below one of the earth traps) to show that proper connection has been made in the "on-view" trap.

Claims

1. An electrical connector in which a flexible wire (3) is placed into electrical connection with an electrically conducting terminal means (B) by means of a two-component wire trap (1, 2), one component (2) of which is electrically connected to the said terminal means (B), **characterised in that** the two components of the wire trap define convex (1) and concave (2) members movable between relatively "open" and "closed" positions about a turning axis (X), and in that a wire passage (7) receiving wire (3) fed in endwise thereof is provided which passage terminates between the two components in their "open" position, whereby an exposed end (3a) of a wire passed along the wire passage (7) is trapped between the concave (2) and convex (1) members as the latter move into their "closed" position, the trapped wire being bent through a right angle or approximately a right angle between the end of the wire passage (7) and its position in the "closed" wire trap (1, 2).

2. A connector as claimed in claim 1, **characterised in that** the concave member (2) is mounted on one part of a body of the connector and convex member (1) is mounted on another part of the connector, the two parts being turnably mounted to move about a turning axis (X) which extends substantially normal to the elongate direction of the wire passage

(7).

3. A connector as claimed in claim 1 or claim 2, **characterised in that** at least two wire traps (1, 2: 1', 2') are provided which move together between their "closed" and "open" positions about a common turning axis (X).

4. A connector as claimed in claim 3, **characterised in that** there are three wire traps, one for a live wire, one for a neutral wire and one for an earth wire.

5. A connector as claimed in any one preceding claim, **characterised in that** two sets of plural wire traps are disposed adjacent to each other, each set of wire traps being independently movable together between their "open" and "closed" positions.

6. A connector as claimed in any one preceding claim, **characterised in that** the members that make up the wire trap are movable between "open" and "closed" positions by means of a captive lid (9) turnably mounted on a body portion (8) of the connector.

7. A connector as claimed in any one preceding claim, **characterised in that** when the wire trap is in the "open" position, the inlet end of the wire passage (7) is exposed to receive wire and to duct a bared end (3a) thereof to a position between the concave and convex members (1, 2).

8. A connector as claimed in any one preceding claim, **characterised in that** a body (8) of the connector includes means (17) to gauge the length of each wire required for correct wiring-up of the connector and/or means (18) to strip the required length of insulation from the free end of each wire.

9. A connector as claimed in any one preceding claim, **characterised in that** a body (8) of the connector incorporates a fuse, a passage being provided in the body (8) into which a cartridge fuse can be located when a lid (9) of the body is in the closed position and which serves to lock the lid in its closed position.

10. A connector as claimed in any one preceding claim, **characterised in that** a body (8) of the connector includes means (19) to allow visual confirmation that at least one of the wires is correctly located in its wire trap (1, 2).

Patentansprüche

1. Elektrischer Verbinder, in dem ein flexibler Draht (3) mittels einer zweiteiligen Drahtfalle (1, 2) in elektrische Verbindung mit einem elektrisch leitfähigen Anschlußmittel (B) gebracht wird, wobei ein Teil (2) der Drahtfalle elektrisch mit dem besagten Anschlußmittel (B) verbunden ist, dadurch gekennzeichnet, daß die zwei Teile der Drahtfalle zwischen relativ "offenen" und "geschlossenen" Positionen um eine Drehachse (X) bewegbare konvexe (1) und konkave (2) Glieder definieren, und daß ein einen mit seinem Ende darin eingeführten Draht (3) aufnehmender Drahtdurchgang (7) vorgesehen ist, der zwischen den zwei Teilen in ihrer "offenen" Position abschließt, womit ein freigelegtes Ende (3a) eines entlang des Drahtdurchgangs (7) geführten Drahtes zwischen den konkaven (2) und konvexen (1) Gliedern bei Bewegung der letzteren in ihre "geschlossene" Position eingefangen wird, wobei der eingefangene Draht rechtwinklig oder annähernd rechtwicklig zwischen dem Ende des Drahtdurchgangs (7) und seiner Stellung in der "geschlossenen" Drahtfalle (1, 2) abgebogen wird.

2. Verbinder nach Anspruch 1, dadurch gekennzeichnet, daß das konkave Glied (2) an einem Teil eines Körpers des Verbinders befestigt ist und das konvexe Glied (1) an einem anderen Teil des Verbinders befestigt ist, wobei die zwei Teile drehbar zur Bewegung um eine Drehachse (X) befestigt sind, die sich im wesentlichen normal zur verlängerten Richtung des Drahtdurchganges (7) erstreckt.

3. Verbinder nach Anspruch 1 oder Anspruch 2, dadurch gekennzeichnet, daß mindestens zwei Drahtfallen (1, 2: 1', 2') vorgesehen sind, die sich zusammen zwischen ihren "geschlossenen" und "offenen" Positionen um eine gemeinsame Drehachse (X) bewegen.

4. Verbinder nach Anspruch 3, dadurch gekennzeichnet, daß drei Drahtfallen, eine für einen stromführenden Draht, eine für einen Nulldraht und eine für einen Erddraht, vorgesehen sind.

5. Verbinder nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß zwei Sätze mehrfacher Drahtfallen nebeneinander angeordnet sind, wobei jeder Satz von Drahtfallen unabhängig zusammen zwischen ihren "offenen" und "geschlossenen" Positionen bewegbar ist.

6. Verbinder nach einem der vorhergehenden An-

sprüche, dadurch gekennzeichnet, daß die die Drahtfalle bildenden Glieder mittels eines drehbar an einem Körperteil (8) des Verbinders befestigten Schnappdeckels (9) zwischen "offenen" und "geschlossenen" Positionen bewegbar sind.

7. Verbinder nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß wenn sich die Drahtfalle in der "offenen" Position befindet, das Einführende des Drahtdurchgangs (7) freigelegt ist, um Draht aufzunehmen und ein abisoliertes Ende (3a) desselben zu einer Position zwischen den konkaven und den konvexen Gliedern (1, 2) zu führen.

8. Verbinder nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß ein Körper (8) des Verbinders Mittel (17) zum Anmessen der für die korrekte Verdrahtung des Verbinders erforderlichen Länge jedes Drahtes und/oder Mittel (18) zum Abisolieren der erforderlichen Länge vom freien Ende jedes Drahtes enthält.

9. Verbinder nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß ein Körper (8) des Verbinders eine Sicherung enthält, wobei im Körper (8) ein Durchgang vorgesehen ist, in den eine Patronensicherung eingelegt werden kann, wenn sich ein Deckel (9) des Körpers in der geschlossenen Position befindet, und der dazu dient, den Deckel in seiner geschlossenen Position zu verriegeln.

10. Verbinder nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß ein Körper (8) des Verbinders Mittel (19) zum Ermöglichen einer Sichtbestätigung, daß sich mindestens einer der Drähte ordnungsgemäß in seiner Drahtfalle (1, 2) befindet, enthält.

Revendications

1. Un connecteur électrique dans lequel un fil souple (3) est placé en connexion électrique avec un moyen de borne électroconducteur (B) au moyen d'un piège à fil à deux composants (1, 2), dont un composant (2) est connecté électriquement audit moyen de borne (B), caractérisé en ce que que les deux composants du piège à fil définissent des éléments convexe (1) et concave (2) se déplaçant entre des positions relativement "ouverte" et "fermée" autour d'un axe rotatif (X), et en ce qu'un passage pour fil (7) recevant un fil (3) passé par son extrémité est fourni, ledit passage se terminant entre les deux composants en position "ouverte", de telle sorte qu'une extrémité dénudée (3a) du fil passé dans le passage pour fil (7) est coincée entre les éléments concave (2) et convexe (1) lorsque ces derniers passent en position "fermée", le fil coincé étant courbé à angle droit ou approximativement à angle droit entre l'extrémité du passage pour fil (7) et sa position dans le piège à fil "fermé" (1, 2).

2. Un connecteur, selon la revendication 1, caractérisé en ce que l'élément concave (2) est monté sur une partie d'un corps du connecteur et l'élément convexe (1) est monté sur une autre partie du connecteur, les deux parties étant montées de manière à pouvoir tourner autour d'un axe rotatif (X) qui s'étend sensiblement à la normale de la direction longitudinale du passage pour fil (7).

3. Un connecteur, selon la revendication 1 ou la revendication 2, caractérisé en ce qu'au moins deux pièges à fil (1, 2: 1',2') sont fournis et se déplacent ensemble entre leurs positions "fermée" et "ouverte" autour d'un axe de rotation commun (X).

4. Un connecteur, selon la revendication 3, caractérisé en ce qu'il existe trois pièges à fil, un pour le fil sous tension, un pour le fil neutre et un pour le fil de mise à la terre.

5. Un connecteur, selon l'une quelconque des revendications précédentes, caractérisé en ce que deux jeux de plusieurs pièges à fil sont disposés l'un à côté de l'autre, chaque jeu de pièges à fil pouvant être indépendamment déplacé entre les positions "ouverte" et "fermée".

6. Un connecteur, selon l'une quelconque des revendications précédentes, caractérisé en ce que les éléments qui composent le piège à fil peuvent être déplacés entre les positions "ouverte" et "fermée" au moyen d'un couvercle captif (9) monté de façon à pouvoir tourner sur une partie du corps (8) du connecteur.

7. Un connecteur, selon l'une quelconque des revendications précédentes, caractérisé en ce que lorsque le piège à fil est en position "ouverte", l'entrée du passage pour fil (7) est exposée pour recevoir le fil et conduire l'extrémité dénudée (3a) de ce fil jusqu'à une position entre les éléments concave et convexe (1, 2).

8. Un connecteur, selon l'une quelconque des

revendications précédentes, caractérisé en ce qu'un corps (8) du connecteur comporte un moyen (17) pour mesurer la longueur nécessaire de chaque fil pour un câblage correct du connecteur et/ou un moyen (18) pour dénuder la longueur d'isolant nécessaire sur l'extrémité libre de chaque fil.

9. Un connecteur, selon l'une quelconque des revendications précédentes, caractérisé en ce qu'un corps (8) du connecteur comporte un fusible, un passage étant prévu dans le corps (8) dans lequel un fusible à cartouche peut être logé lorsqu'un couvercle (9) du corps est en position fermée, et qui sert à verrouiller le couvercle en position fermée.

10. Un connecteur, selon l'une quelconque des revendications précédentes, caractérisé en ce qu'un corps (8) du connecteur comporte un moyen (19) permettant de confirmer visuellement qu'au moins l'un des fils est correctement placé dans le piège à fil (1, 2).

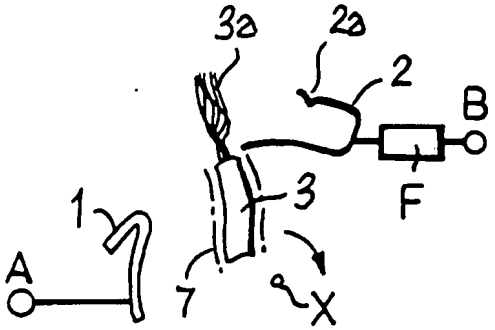

FIG.1

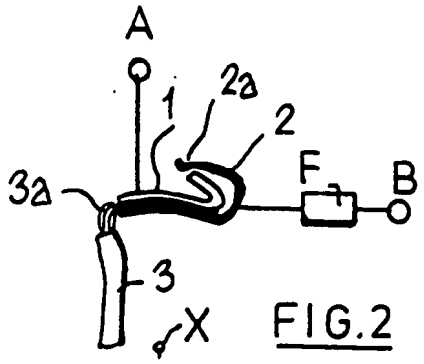

FIG.2

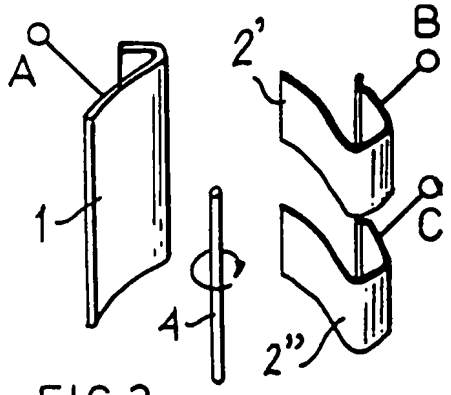

FIG.3

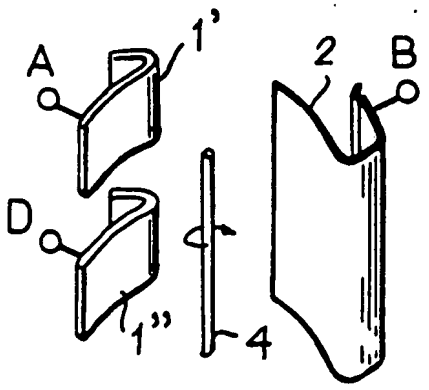

FIG.4

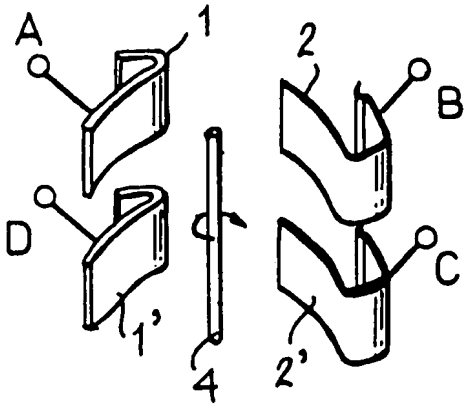

FIG.5

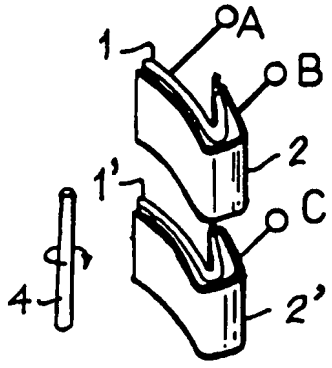

FIG.6

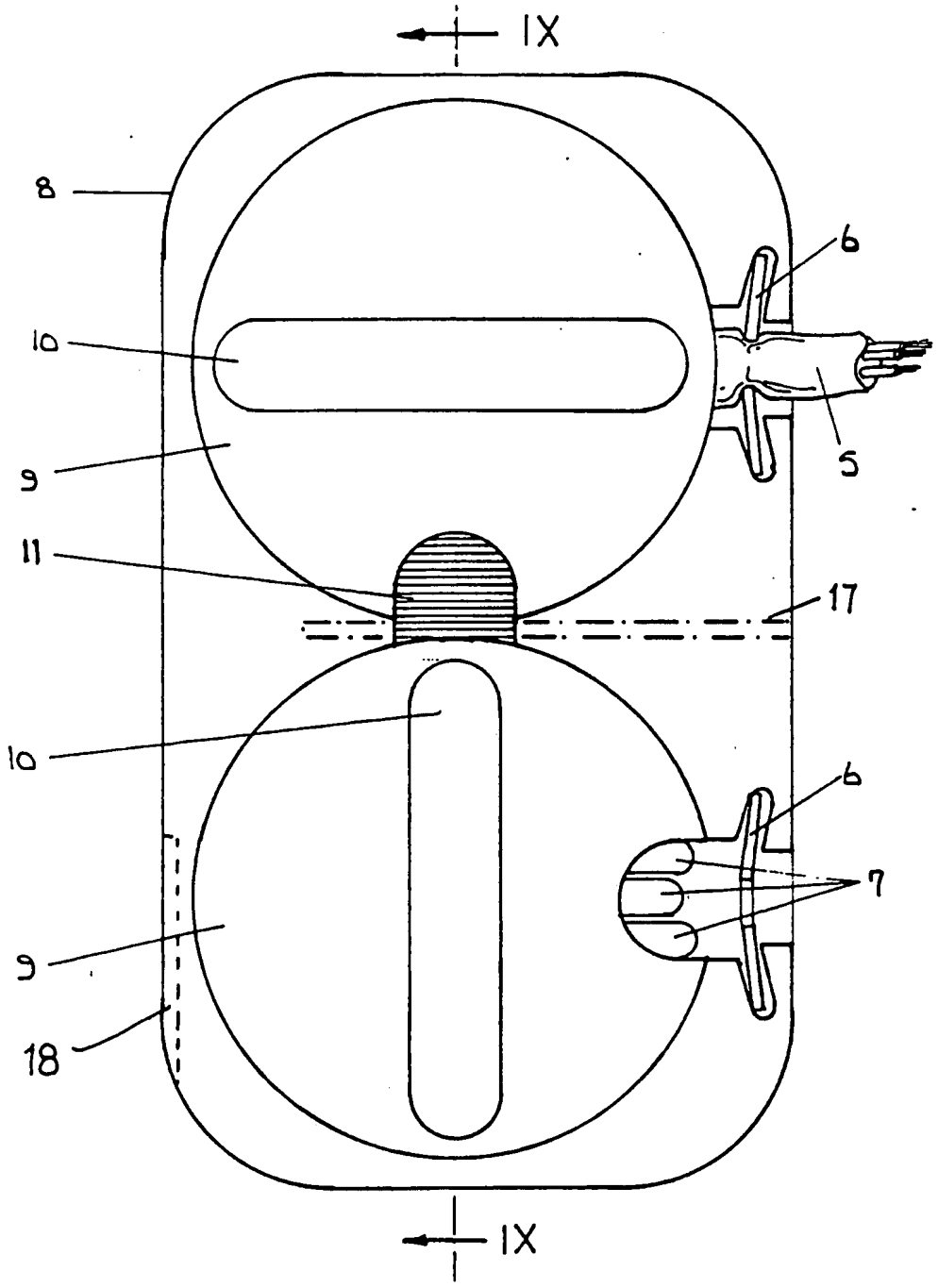

FIG.7

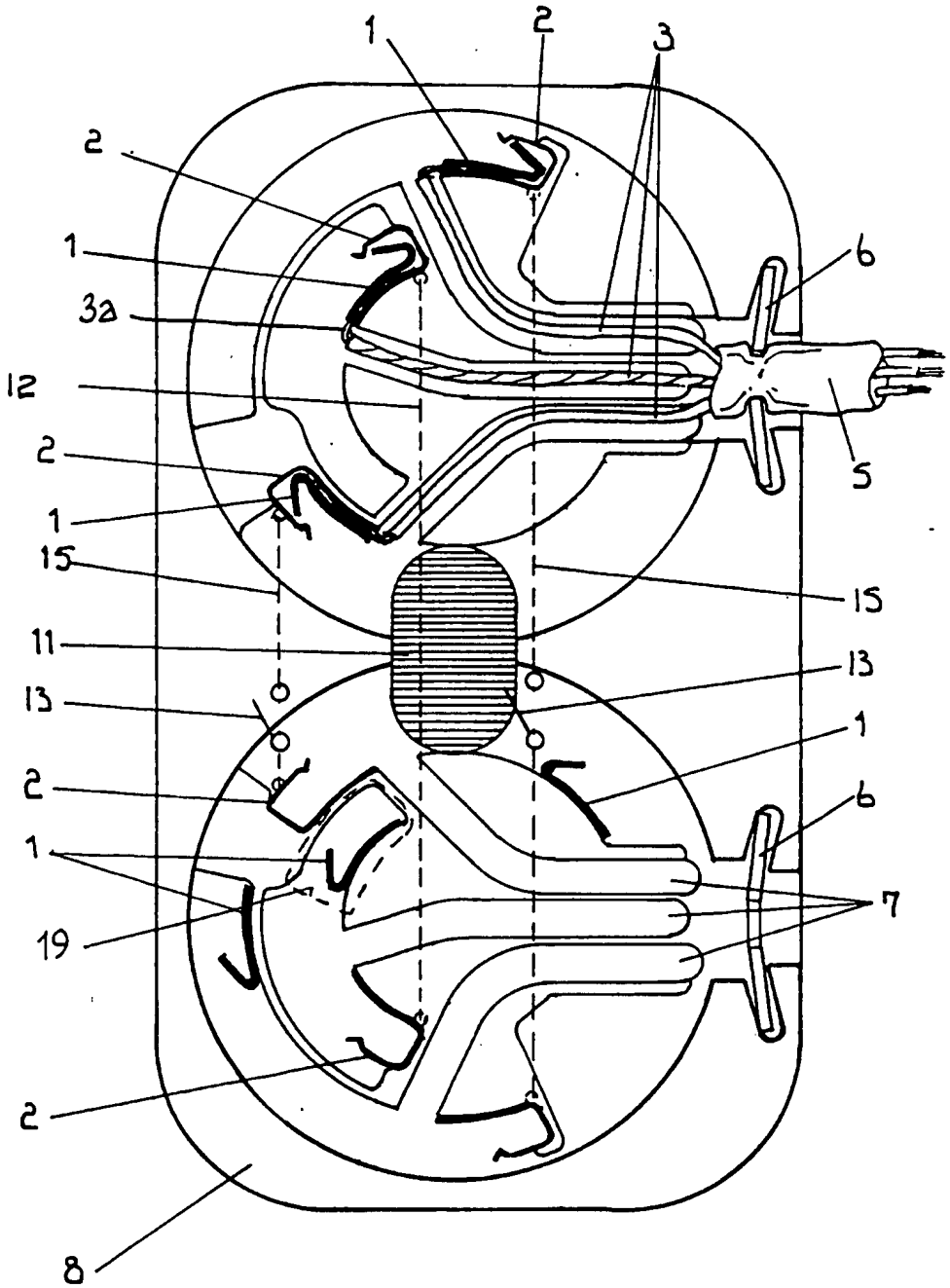

FIG.8

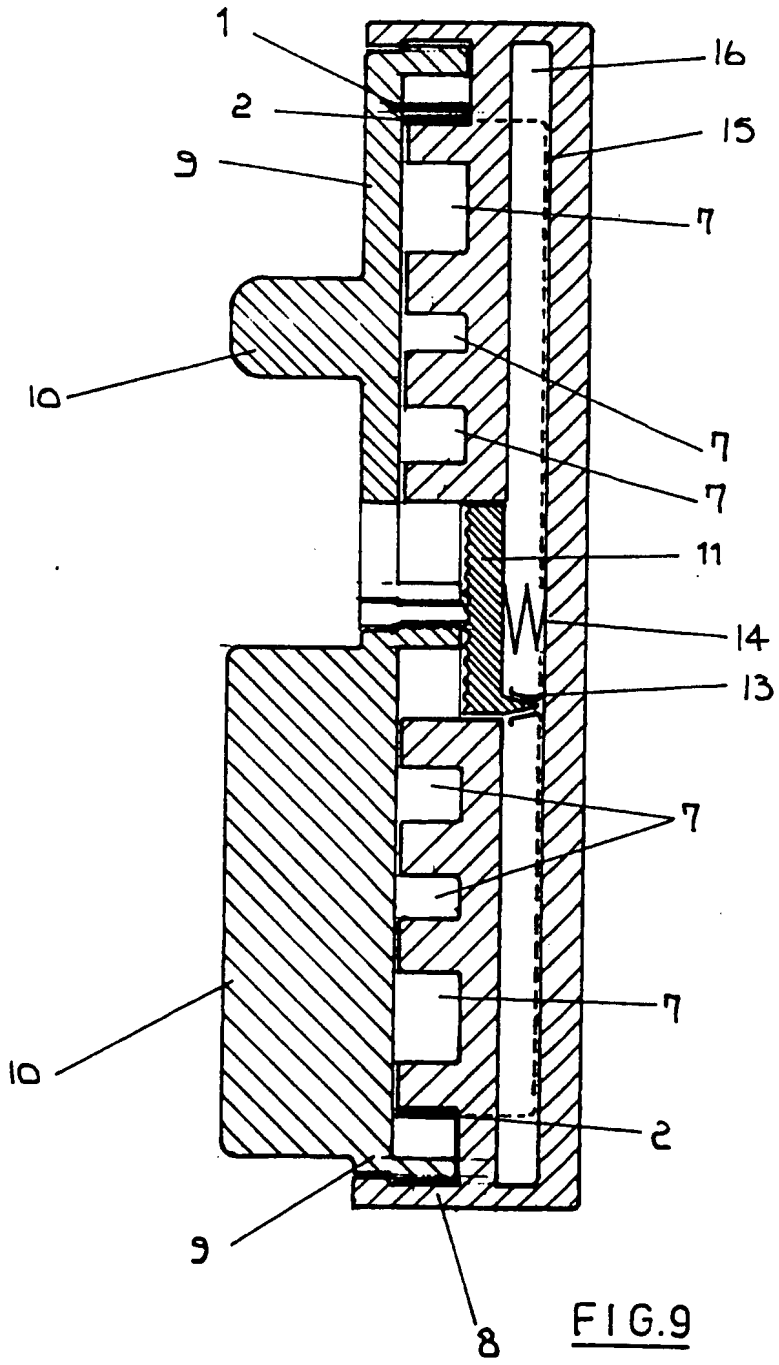

FIG.9